

Fluoroquinolone Resistance in Campylobacter from Chickens and Human Health Impact: A Quantitative Risk Assessment Using FoodNet and Other Sources of Data

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Background: Emerging antimicrobial resistance, due to use of antimicrobials, is a public health concern in human and animal medicine worldwide. Animals serve as reservoirs for many foodborne pathogens, including Salmonella and Campylobacter. Antibiotic resistant organisms may be present in or on animals as a result of drug use. These resistant foodborne pathogens can contaminate a carcass during slaughter or processing. When these resistant bacteria cause illness in a person who needs treatment, medical therapy may be compromised if the pathogenic bacteria are resistant to the drug(s) used for treatment. Fluoroquinolones are effective against most bacterial enteric pathogens and are often used to treat Campylobacter infections. Campylobacter is the predominant bacterial cause of enteric infections. Fluoroquinolones were approved for treatment of colibacillosis in poultry in 1995. The FDA Center for Veterinary Medicine (CVM) developed a risk assessment model that evaluates the risk of fluoroquinolone resistant Campylobacter infections from consumption of chicken that are attributed to use of fluoroquinolones in chickens.

Methods: A mathematical model was developed to relate the prevalence of resistant Campylobacter infections in humans, due to consumption of chicken, to the prevalence of resistant Campylobacter in chickens. The model uses data from recently initiated surveillance systems (FoodNet and the National Antimicrobial Resistance Monitoring Program, [NARMS]) that monitors incidence of foodborne disease, and prevalence of fluoroquinolone resistance, as well as data from the published literature.

Results: The model estimates a mean of 2 million cases of Campylobacter for 1998 in the US. Approximately 50 to 70% of Campylobacter infections were attributed to exposure to chicken. Of these chicken associated infections seeking care and receiving treatment, 55% received a fluoroquinolone. An estimated 5000 people (5%-95% confidence interval 2600 to 8600) became ill with a fluoroquinolone resistant Campylobacter infection associated with consuming chicken and received fluoroquinolones for their illness. The risk assessment also described data gaps and data limitations and gives detailed assumptions where data were lacking.

Conclusions: This risk assessment indicates that approximately five thousand people who are ill with fluoroquinolone resistant infections could be treated with a fluoroquinolone and that treatment is potentially compromised due to resistance. Surveillance data can be used to update the model annually and will indicate changes in level of resistance and incidence of campylobacteriosis. These changes may reflect alterations in food animal production, processing or may indicate changes in bacterial virulence or a change in the susceptibility of the human population. Forecasting potential changes in level of resistance in chickens could provide a means to mitigate the human health impact.

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